

14 July 2004

CRUISE RESULTS  
NOAA Fisheries Research Vessel ALBATROSS IV  
Cruise No. AL 04-05  
Ecosystems Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was 24 May - 8 June 2004. The NOAA fisheries research vessel ALBATROSS IV covered the Mid-Atlantic Bight, Southern New England, Georges Bank, and Gulf of Maine regions (Figure 1) for the Late Spring Ecosystems Monitoring Survey.

OBJECTIVES

The primary objective of the cruise was to assess changing biological and physical properties which influence the sustainable productivity of the living marine resources of the Mid-Atlantic, Southern New England, Georges Bank and Gulf of Maine portions of the northeast continental shelf ecosystem.

Secondary objectives of this cruise involved the following sampling:

- comparison plankton tows in deep basin areas of the Gulf of Maine to assess the difference in zooplankton volumes and composition between tows to 200 m and tows to within 5 meters of the bottom. These deep tows also provide hydrographic data detailing incursions of Labrador Current Water into the Gulf of Maine.
- collection of phytoplankton samples for nitrogen stable isotope ratios,
- collection of samples for zooplankton genetics (genome) studies,
- examination of plankton samples for concentrations of Calanus finmarchicus to correlate with right whale sightings.

METHODS

The survey consisted of 120 randomly distributed stations at which the vessel stopped to lower instruments over the side. One non-random station was added to the Northeast Channel at which a CTD cast was made to document characteristics of the Gulf of Maine outbound water column, and 3 non-random stations were sampled in the Gulf of Maine region, giving a total of 124 stations sampled.

Key parameters measured included water column temperature, salinity, ichthyoplankton and zooplankton composition, abundance and distribution, and along-track chlorophyll-a fluorescence.

A double oblique tow using the 61-centimeter Bongo sampler and a Seabird CTD was made at 123 stations. The tow was made to approximately 5 meters above the bottom, or to a maximum depth of 200 meters, at a ship speed of 1.5 knots. On the 3 Gulf of Maine deep basin stations, additional tows to below 200 meters were made immediately after the 200 meter tows, with the ship returning to the same position that the 200 meter tow had started at. These special tows brought the sampling nets to within 5 meters of the bottom for comparison of the zooplankton volume and composition between the 200 meter and deeper tows in the same area. Plankton sampling gear consisted of a 61-centimeter mouth diameter aluminum Bongo frame with two 333-micron nylon mesh nets. A 45-kilogram lead ball was attached by an 80-centimeter length of 3/8-inch diameter chain below the aluminum Bongo frame to depress the sampler. A digital flowmeter was suspended within the mouth of each sampler to determine the amount of water filtered by each net. The plankton sampling gear was deployed over the port side of the vessel by means of a conducting-cable winch and a powered boom. The 61-centimeter Bongo plankton samples were preserved in a 5 % solution of formalin in seawater. Tow depth was monitored in real time with a Seabird CTD profiler. The Seabird CTD profiler was hard-wired to the conductive towing cable, providing simultaneous depth, temperature, and salinity data for each plankton tow.

Twenty phytoplankton samples for nitrogen-stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Samples of 400 to 1000 milliliters of seawater were pre-filtered through 300 micron mesh nitex gauze to remove most zooplankton, then filtered through a Whatman GFF glass-fiber filter and flash frozen for analysis ashore.

A total of twenty zooplankton genetics samples were collected at five randomly selected stations within each of the Mid-Atlantic, Southern New England, Georges Bank and Gulf of Maine regions. These samples were collected with a 20 cm Bongo frame fitted with paired 165 micron mesh nets and this array was attached to the towing wire above the Seabird CTD with a wire stop. The samples were preserved in 95% ethanol. After 24 hours of initial preservation, the alcohol was changed.

Following the cruise, samples with large numbers of Calanus finmarchicus were measured for settled volumes and the data forwarded to Pat Gerrior, the Regional Right Whale Sighting Coordinator, and to Tim Cole of the Protected Species Branch.

Continuous monitoring of the seawater salinity, and chlorophyll-a level, was done at a depth of 3.7 meters along all of the cruise track by means of a thermosalinograph, and a flow-through fluorometer. The SCS system recorded the output from both the thermosalinograph, and the fluorometer at ten seconds intervals. The data records were given a time-date stamp from the GPS unit.

Samples for Seabird CTD salinity and fluorometer sensor data calibration were obtained on the 12-6 watch by taking a water sample from 30 or more meters depth using a 1.7 liter Niskin bottle. Calibration of the fluorometer and CTD salinities from the surface flow-through system was undertaken on the 6-12 watch. Sample analysis for these calibrations followed the protocol outlined in the Ecosystem Monitoring Program Operations Manual.

## RESULTS

A summary of routine survey activities is presented in Table 1. Areal coverage for the cruise is shown in Figure 1. The ALBATROSS IV sailed at 1400 hours EDT on Monday 24 May from the NEFSC, Woods Hole Massachusetts. Weather conditions were favorable with clear sunny skies and light winds, permitting the vessel to travel at full speed as it headed south to start working in the southwest portion of the Southern New England area.. The good weather made it possible to work southward picking up all the offshore stations first, with progress being so rapid that the southernmost station off of Cape Hatteras was reached by the evening of Wednesday, 26 May. A fast-moving thunderstorm passed through this area but the seas did not increase significantly, and work was able to continue uninterrupted. The calm seas permitted sampling to continue at such a good rate that it became apparent that all of the Mid-Atlantic Bight and Southern New England would be completed prior to the agreed upon port call date, and a route was plotted to pick up stations on the southwest corner of Georges Bank. This would enable the second leg to save a considerable amount of time by being able to start at a more northern latitude on Georges Bank, prior to proceeding into the Gulf of Maine. Operations on the first leg were completed on early Tuesday morning, 1 June 2004. The Albatross IV docked in Woods Hole at 0930 EDT, 1 June 2004. New personnel for the second part of the cruise arrived in the early afternoon, and spent the remainder of the day conferring with the chief scientist from Part 1, then sailed the following day at 1246 hours EDT on Wednesday, 2 June, from NEFSC, Woods Hole, Massachusetts to begin part two of the Late Spring Ecosystems Monitoring Survey. Due to the illness of one of the student volunteers from the first leg, only 3 scientific staff sailed on the second part. Shortly after departure a ship's meeting was held to review survey operations and vessel safety procedures for the cruise. Afterwards, both fire and abandon ship drills were held for the entire ships personnel. Weather condition were favorable with clear sunny skies and a southwesterly breeze of about 18 knots. The vessel transited through the Great Round Shoal Channel to begin survey operations in the Great South Channel and on to Georges Bank. The cruise track was selected to survey along the southern and central portion of Georges Bank from west to east and then to survey the northern part of the Bank from east to west. The Gulf of Maine was sampled in a similar pattern.

The ship arrived on the first station for this part of the survey on 2 June at 2030 hrs EDT. Weather conditions for the entire survey were favorable which allowed for rapid transit between stations. In addition, vessel personnel were very familiar with the required work procedures and survey operations progressed on an efficient and routine basis. During the early evening hours (1730 hrs EDT) on Friday, 4 June, the carcass of a dead long-fin pilot whale was seen floating between stations 94 and 95 in the Gulf of Maine at Lat. 41° 31.0' N, and Long. 67° 35.0' W. The officer on watch obtained several photographs of the pilot whale. The position of the sighting was sent via e-mail to the Protected Species Branch, at the NEFSC, Woods Hole.

In addition to the predetermined survey stations, four additional stations were occupied. A CTD cast was made in the Northeast Channel to provide hydrographic data detailing the incursion of Labrador Current Water into the Gulf on Maine. Two bongo casts were made in Wilkinson Basin, Georges Basin and Jordans Basin. The first bongo tow in each basin was made to 200 m, while the second tow was made to within 5 meters of the bottom. These tows were done to assess the difference in zooplankton volumes and the composition between the 200 m tows and the tows to within 5 m of the basin bottom.

The last station was completed off Cape Cod in the Great South Channel on Tuesday, 8 June, at 0230 hrs and the ship proceeded through the Great Round Shoal Channel to Woods Hole. R/V ALBATROSS IV arrived at the NEFSC Woods Hole, Massachusetts, dock at 1000 hrs Tuesday and completed cruise AL0405.

## DISPOSITION OF SAMPLES AND DATA

All samples and data, except for the nitrogen isotope samples, the zooplankton genetics samples and the Seabird CTD data and logs, were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The nitrogen isotope samples were delivered to Rick McKinney at the US EPA Lab in Narragansett, RI. The zooplankton genetics samples were deposited at the Woods Hole Oceanographic Institute. The CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. Calanus volume information was forwarded to Pat Gerrior and Tim Cole after the cruise

## SCIENTIFIC PERSONNEL

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Table 1. STATION OPERATION REPORT FOR CRUISE AL0405

CAST	STA.	Date (GMT)	TIME (GMT)	LAT	LONG	DEPTH	OPER.
							B=bongo W=water

mm dd yy hr min (m)

1	1	5	25	2004	6	54	4006.5	7210.2	69		W
2	1	5	25	2004	7	4	4006.7	7210.2	70		B
3	2	5	25	2004	9	23	4001.3	7238.4	59		B
4	3	5	25	2004	12	54	3925.7	7247.4	68	B, CO/ 528cc, N1	
5	4	5	25	2004	15	33	3859.1	7258.8	86		B
6	5	5	25	2004	16	25	3851.7	7258.7	106		W
7	5	5	25	2004	16	32	3851.5	7258.7	116	B, CO/ 475cc	
8	6	5	25	2004	17	22	3846.4	7303	171	B, CO/ 554cc	
9	7	5	25	2004	20	18	3848.6	7340	56		B
10	8	5	25	2004	21	16	3841.2	7345	53		B
11	9	5	25	2004	22	9	3843.6	7352.4	45	B, Z1	
12	10	5	26	2004	0	1	3829	7408.2	49	B, Z2	
13	11	5	26	2004	3	7	3823.7	7329.1	133	B, CO/ 275cc, N2	
14	12	5	26	2004	5	33	3811.1	7354.7	100		W
15	12	5	26	2004	5	41	3811.1	7354.6	99		B
16	13	5	26	2004	10	48	3726	7438.2	59		B
17	14	5	26	2004	14	0	3659.2	7506.4	39	B, N3, Z3	
18	15	5	26	2004	16	24	3638.6	7452.9	43		W
19	15	5	26	2004	16	31	3638.5	7453	43		B
20	16	5	26	2004	17	51	3626.5	7458.4	36		B
21	17	5	26	2004	19	19	3614	7508.3	32		B
22	18	5	26	2004	21	20	3559.3	7451.2	95	B, N4	
23	19	5	27	2004	1	33	3523.9	7524.6	19		B
24	20	5	27	2004	5	54	3603.7	7536.7	23		W
25	20	5	27	2004	6	0	3603.8	7536.7	23	B, N5	
26	21	5	27	2004	10	47	3645.9	7536	20		B
27	22	5	27	2004	12	47	3655.9	7555.7	19	B, N6	
28	23	5	27	2004	16	42	3716.3	7512.8	26		W
29	23	5	27	2004	16	47	3716.3	7512.9	25		B
30	24	5	27	2004	18	27	3726.2	7530.5	20		B
31	25	5	27	2004	20	42	3741.1	7508.9	29		B
32	26	5	27	2004	21	49	3748.5	7516.9	12	B, Z4	
33	27	5	28	2004	1	1	3803.8	7441.4	30		B
34	28	5	28	2004	5	1	3846.5	7449	16		W
35	28	5	28	2004	5	7	3846.6	7449	17	B, N7	
36	29	5	28	2004	7	45	3853.7	7416.7	39		B
37	30	5	28	2004	11	45	3936.2	7404.5	16		B
38	31	5	28	2004	14	9	3933.6	7336.8	32	B, CO/ 285cc	
39	32	5	28	2004	15	18	3943.5	7334.6	35	B, CO/ 343cc	
40	33	5	28	2004	17	51	4001.3	7358.8	21		W

Table 1.(continued) STATION OPERATION REPORT FOR CRUISE AL0405

[illegible]

mm dd yy hr min (m)

41	33	5	28	2004	17 57	4001.3	7358.8	21		B
42	34	5	28	2004	20 18	4014.4	7331.7	30		B, N8
43	35	5	28	2004	22 37	3956.2	7310.7	77		B
44	36	5	28	2004	23 18	4001.0	7312.6	45		B
45	37	5	29	2004	0 24	4011.1	7310.6	42		B
46	38	5	29	2004	2 51	4035.5	7308.6	20		B, N9
47	39	5	29	2004	5 48	4028.6	7230.8	45		W
48	39	5	29	2004	5 55	4028.6	7230.6	46		B
49	40	5	29	2004	10 19	3956.3	7149.1	112		B, CO/ 296cc
50	41	5	29	2004	12 41	4005.9	7122.7	92		B, N10, CO/ 449cc
51	42	5	29	2004	14 21	4016.2	7109.2	95		B
52	43	5	29	2004	15 13	4020.8	7103.1	91		B
53	44	5	29	2004	17 39	4004.0	7041.3	131		W
54	44	5	29	2004	17 47	4004.1	7041.3	131		B
55	45	5	29	2004	19 49	4001.3	7018.1	240		B
56	46	5	29	2004	23 14	4033.6	7020.8	60		B
57	47	5	30	2004	1 26	4036.2	6950.4	58		B, Z8
58	48	5	30	2004	2 45	4031.5	6935.2	65		B
59	49	5	30	2004	4 41	4018.7	6914.6	85		W
60	49	5	30	2004	4 48	4018.7	6914.5	84		B, CO/ 607cc
61	50	5	30	2004	5 36	4013.7	6912.6	95		B, CO/ 634cc
62	51	5	30	2004	7 38	4011.4	6846.9	139		B, CO/ 1003cc
63	52	5	30	2004	12 9	4021.4	6749.0	164		B, N11, CO/ 264cc
64	53	5	30	2004	14 34	4040.9	6736.7	82		B, Z9
65	54	5	30	2004	16 1	4046.1	6720.7	92		W
66	54	5	30	2004	16 9	4046.1	6720.5	93		B
67	55	5	30	2004	17 35	4046.3	6736.5	76		B
68	56	5	30	2004	18 11	4048.6	6742.5	70		B
69	57	5	30	2004	19 22	4048.9	6758.5	67		B
70	58	5	30	2004	20 30	4041.3	6806.8	80		B
71	59	5	30	2004	22 30	4041.1	6834.5	56		B, Z10
72	60	5	30	2004	23 34	4051.0	6840.4	62		B
73	61	5	31	2004	3 24	4118.4	6918.6	80		B
74	62	5	31	2004	5 5	4059.0	6918.6	46		W
75	62	5	31	2004	5 11	4058.8	6918.6	48		B
76	63	5	31	2004	6 49	4041.3	6920.9	42		B
77	64	5	31	2004	8 52	4101.7	6931.7	32		B
78	65	5	31	2004	11 36	4046.3	6956.4	30		B
79	66	5	31	2004	15 10	4112.9	7006.0	16		B, Z11
80	67	5	31	2004	19 0	4056.3	7046.7	51		W

Table 1.(continued) STATION OPERATION REPORT FOR CRUISE AL0405

CAST	STA.	Date (GMT)	TIME (GMT)	LAT	LONG	DEPTH	OPER.
							B=bongo W=water Z=zooogen N=nitrogen

Table 1. Vertical and horizontal coordinates of the 120 hauls made during the 2004 summer survey										
Haul	Date				Time		Lat	Long	Depth (m)	Tow
	mm	dd	yy	hr	min					
81	67	5	31	2004	19	6	4056.3	7046.8	51	B, CO/ 475cc
82	68	5	31	2004	21	12	4056.3	7110.8	52	B, CO/ 554cc
83	69	5	31	2004	23	16	4053.9	7132.8	56	B, Z11, CO/ 333cc
84	70	6	1	2004	0	20	4058.5	7130.5	51	B
85	71	6	1	2004	9	17	4121.3	7106.0	24	W
86	71	6	1	2004	9	27	4121.3	7106.0	26	B, N12, CO/ 475cc
87	72	6	3	2004	0	37	4129.0	6852.9	137	B, CO/ 195cc
88	73	6	3	2004	1	38	4136.1	6848.5	150	B, Z13, CO/ 412cc
89	74	6	3	2004	5	28	4111.0	6804.4	48	B
90	75	6	3	2004	7	39	4118.7	6738.6	38	B
91	76	6	3	2004	8	52	4114.1	6726.8	44	W
92	76	6	3	2004	9	6	4113.0	6727.5	44	B
93	77	6	3	2004	11	49	4116.8	6656.8	68	B, Z14
94	78	6	3	2004	13	43	4119.1	6635.1	86	B
95	79	6	3	2004	14	37	4116.3	6629.2	92	B, CO/ 317cc
96	80	6	3	2004	16	10	4103.9	6624.7	430	W
97	80	6	3	2004	16	35	4104.5	6624.7	541	B
98	81	6	3	2004	18	22	4118.7	6612.9	142	B, Z15, CO/ 385cc
99	82	6	3	2004	20	44	4136.0	6626.5	84	B
100	83	6	3	2004	22	2	4146.0	6620.8	80	B, CO/ 359cc
101	84	6	3	2004	23	46	4150.7	6601.2	100	B, N13, Z16, CO/ 195cc
102	85	6	4	2004	1	53	4159.0	6631.0	87	B
103	86	6	4	2004	4	17	4146.3	6654.6	64	W
104	86	6	4	2004	4	22	4146.4	6654.4	63	B, N14
105	87	6	4	2004	5	46	4153.7	6702.5	58	B
106	88	6	4	2004	6	33	4158.6	6704.8	63	B
107	89	6	4	2004	7	26	4201.1	6712.7	51	B
108	90	6	4	2004	9	16	4201.3	6734.6	42	B, CO/ 169cc
109	91	6	4	2004	11	30	4149.0	6800.5	53	B, N15, CO/ 201cc
110	92	6	4	2004	12	47	4201.3	6757.0	190	B, CO/ 459cc
111	93	6	4	2004	16	41	4238.6	6818.7	187	W
112	93	6	4	2004	16	50	4238.7	6818.8	201	B, Z17, CO/ 633cc
113	94	6	4	2004	20	0	4243.8	6739.6	187	B, CO/ 95cc
114	95	6	4	2004	23	7	4216.9	6728.8	279	B, CO/ 285cc
115	95	6	4	2004	23	30	4217.3	6729.4	278	V
116	96	6	5	2004	0	46	4221.3	6715.0	312	B, CO/ 396cc
117	96	6	5	2004	1	8	4222.1	6714.9	327	V
118	97	6	5	2004	2	30	4225.2	6700.1	361	Haul 1 B, CO/ 739cc
119	97	6	5	2004	3	9	4225.1	6659.8	361	D Haul 2 B, CO/ 792cc
120	98	6	5	2004	5	19	4208.7	6652.6	96	W

	mm	dd	yy	hr	min		(m)		D=deep tow CO=Calanus observed/vol
121	98	6	5	2004	5	25	4208.8	6652.4	99 B, CO/ 438cc
122	99	6	5	2004	9	27	4213.7	6546.2	221 V
123	100	6	5	2004	12	25	4236.3	6523.2	93 B
124	101	6	5	2004	16	9	4243.9	6620.7	85 W
125	101	6	5	2004	16	14	4244.1	6620.6	83 B, CO/ 195cc
126	102	6	5	2004	18	23	4306.1	6628.8	106 B, Z18
127	103	6	5	2004	21	22	4256.1	6708.5	245 B, CO/ 132cc
128	103	6	5	2004	21	44	4255.4	6708.5	252 V
129	104	6	6	2004	1	21	4324.1	6742.1	246 Haul1 B, CO/ 475cc
130	104	6	6	2004	2	9	4324.1	6742.4	248 D Haul2 B, CO/ 496cc
131	105	6	6	2004	4	17	4326.6	6720.8	206 W
132	105	6	6	2004	4	23	4326.4	6720.8	187 B, N16, CO/ 185cc
133	106	6	6	2004	5	34	4336.4	6717.0	182 B, CO/ 338cc
134	107	6	6	2004	7	18	4346.2	6702.8	139 B, CO/ 359cc
135	108	6	6	2004	8	51	4356.4	6714.3	169 B, CO/ 216cc
136	109	6	6	2004	12	10	4411.2	6635.0	84 B, N17, CO/ 158cc
137	110	6	6	2004	16	3	4428.4	6727.2	71 B
138	110	6	6	2004	16	15	4428.2	6727.2	71 W
139	111	6	6	2004	20	18	4345.5	6743.6	235 B, Z19, CO/ 222cc
140	111	6	6	2004	20	35	4345.1	6743.9	235 V
141	112	6	6	2004	22	24	4339.0	6808.5	186 B, CO/ 190cc
142	113	6	7	2004	0	19	4348.7	6834.4	123 B, N18, CO/ 132cc
143	114	6	7	2004	2	50	4329.3	6818.8	177 B, CO/ 301cc
144	115	6	7	2004	5	31	4316.2	6846.7	147 W
145	115	6	7	2004	5	38	4316.1	6846.8	147 B, CO/ 243cc
146	116	6	7	2004	7	38	4258.9	6854.5	157 B, CO/ 195cc
147	117	6	7	2004	12	42	4304.0	7006.6	133 B, Z20
148	118	6	7	2004	14	2	4311.3	7018.3	105 B, N19
149	119	6	7	2004	19	13	4216.3	7034.7	54 W
150	119	6	7	2004	19	19	4216.2	7034.8	53 B, N20
151	120	6	7	2004	21	14	4223.9	7010.8	79 B
152	121	6	7	2004	23	37	4229.5	6940.5	258 Haul1 B, CO/ 370cc
153	121	6	8	2004	0	12	4229.6	6940.5	259 D Haul2 B, CO/ 354cc
154	122	6	8	2004	2	20	4213.9	6927.0	203 B, CO/ 422cc
155	123	6	8	2004	4	15	4208.6	6904.8	166 W
156	123	6	8	2004	4	21	4208.5	6904.9	168 B, CO/ 644cc
157	124	6	8	2004	6	10	4156.3	6920.6	206 B, CO/ 428cc

TOTALS: Bongo Casts = 126 (3 were deep basin tows)  
 Bongo 6B3Z Samples = 125  
 Bongo 6B3I Samples = 125  
 Water Samples = 26  
 CTD Casts = 157  
 Nitrogen samples = 20  
 Zoogen samples = 20  
Calanus observations = 52



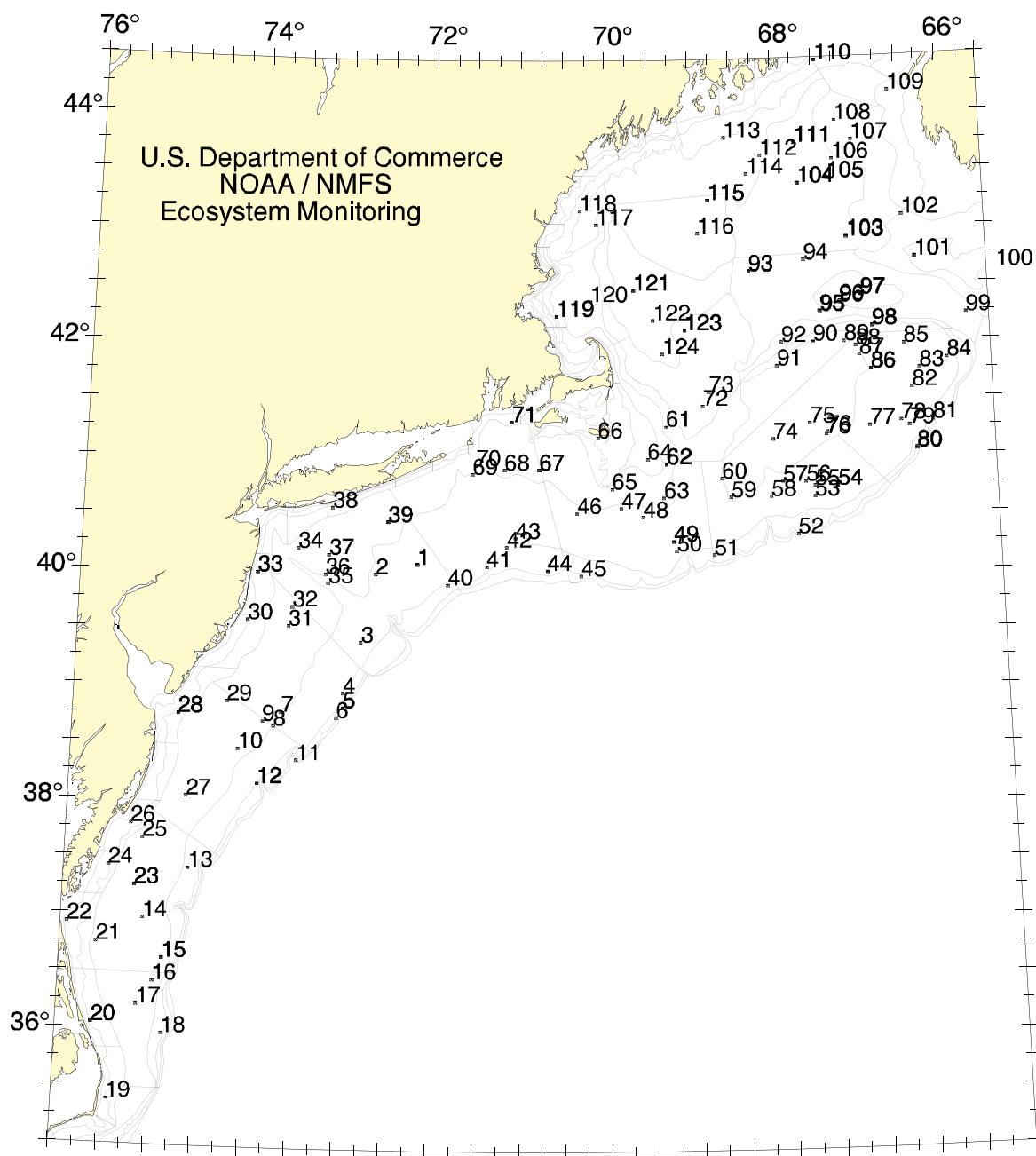


Figure 1. Station locations numbered consecutively for Late Spring Ecosystems Monitoring Cruise AL 04-05, 24 May - 8 June 2004.